

REMARKS

Claims 1-20 are pending in the present application. Claims 1-20 have been rejected. Claims 1 and 18 are amended by this Amendment. Support for this Amendment is found generally throughout the specification and specifically on page 5 lines 14-15. No new matter has been added. Accordingly, Claims 1-20 remain pending in the present application. Reconsideration is respectfully requested in view of the amendments to the claims and the following remarks.

Present Invention

The present invention relates generally to a semiconductor fabrication system and more specifically to a semiconductor fabrication system which employs low substrate temperature as a process condition throughout the deposition process.

Claim Rejections - 35 U.S.C. § 103

Claims 1, 2, 5-9 and 14-16 are rejected under 35 U.S. C. 103(a) as being unpatentable over Shi et al. (U.S. Pat. 6,642,702) in view of Scobey et al. (U.S. Pat. 4,851,095) and Sato et al. (U.S. Pat. 5,286,296).

Examiner Stated:

Regarding claim 1, Shi et al. teach a fabrication system in Figs. 5 and 6. (See Figs. 5 and 6) Shi et al. teach a main housing chamber 41 provided with several small chambers or stations 42. In each station is provided a planar-magnetron-sputtering cathode 43 or a pair of facing-targets-sputtering cathode 44. The main chamber and each station have their own vacuum pumping means and gas-supplying component (not shown). (Column 7 lines 1-18)

Regarding claim 2, one of the deposition chambers is a facing-targets-sputtering cathode 44 (Column 7 lines 5-7)

Regarding claim 5, a robot arm is used for moving the substrate (See Fig. 5)

Regarding claim 6, magnetrons are coupled to the chamber through the facing target sputtering devices. (Column 7 lines 1-18)

Regarding claim 7, a chuck heater can be mounted above the substrate holder by simply replacing one of the cathodes in the sputtering station with a heating means. (Column 7 lines 27-30)

Regarding claim 8, the substrate holder 47 is rotated on its center axis via a step-motor 48 (Column 7 lines 19-22)

Regarding claim 9, the arm moves the substrates to the different coating stations. (See Figs. 5 and 6; Column 10 lines 3-12)

Regarding claim 14, the main chamber has a vacuum pump. (Column 7 lines 9-11)

Regarding claim 15, the chamber is provided with their own vacuum pumping means. (Column 7 lines 9-11)

Regarding claim 16, the substrate holder can be supported from underneath in Fig. 7b. (See Fig. 7b)

The differences between Shi et al. and the present claims are that the “adjacent” relationship of the chambers is not discussed (Claim 1), the

chambers being positioned within the “air-tight housing” is not discussed (Claim 1), the use of an inert gas as the admitted gas is not discussed (Claim 1) and utilizing the apparatus for semiconductor fabrication is not discussed (Claim 1).

Regarding the “adjacent” relationship of the chambers, Shi et al. in Figs. 5 and 6 show an “adjacent” relationship for the deposition chambers. (See Shi et al. Figs. 5 and 6) Scobey et al. show that instead of rotating substrate past deposition chambers (See Scobey et al. Fig. 2) that the deposition chambers can be “adjacent” to one another. (See Scobey et al. Fig. 18)

The motivation for having an “adjacent” relationship is that it allows for deposition of layers on the substrate (See Scobey et al. Abstract)

Regarding the deposition chambers being within the “air-tight” housing, Scobey et al. show in Fig 2 and Fig 18 that the deposition chambers can be located within the “air-tight” housing. (See Scobey et al. Figs. 2 and 18)

The motivation for providing deposition chambers within an “air-tight” housing is that it allows for providing for differentially pumped atmospheres. (Scobey et al. Abstract)

Shi et al. suggest utilizing argon for the sputtering gas. (Column 1 lines 10-17) Sato et al. suggest inserting an inert gas such as nitrogen or argon into the transfer chamber. (Column 2 lines 63-68; Column 1-3)

The motivation for utilizing argon gas in the chambers is that it allows for sputtering of the target and preventing contamination of the deposition chambers. (Column 3 lines 4-6)

Sato et al. suggest that multichamber apparatus can be used for fabricating semiconductors. (Column 1 lines 8-10)

The motivation for utilizing a multichamber apparatus is that it allows for fabricating semiconductors of high complexity with different processes. (Column 1 lines 10-18)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Shi et al. by providing an “adjacent” relationship as taught by Shi et al. and Scobey et al., to have provided the deposition chambers within an “air-tight” housing as taught by Scobey et al., to have utilized argon as taught by Shi et al. and Sato et al. and to have utilized a multichamber apparatus for fabricating semiconductor substrates as taught by Sato et al. because it allows for depositing layers on a substrate, for providing differentially pumped atmospheres, for sputtering a target with prevention of contamination of the deposition chambers for fabricating semiconductors with high complexity.

Applicable Statute and Law

The relevant code section is 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action and states:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

The relevant law concerns the factual inquiries set forth in the landmark case of *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. §103(a) and are summarized as follows:

- 1. Determining the scope and contents of the prior art.**
- 2. Ascertaining the differences between the prior art and the claims at issue.**
- 3. Resolving the level of ordinary skill in the pertinent art.**
- 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.**

Argument

As to Claim 1:

Applicant respectfully submits that the combination of Shi, Scobey, and Sato does not result in the claimed invention. At best, the proposed combination would result in a semiconductor fabrication apparatus that utilizes several small chambers which are adjacent to each other and located within an air-tight housing. The admissible gas used in such a process would be an inert gas such as Argon.

By contrast, please see Applicant's amended Claim 1:

**1. (Currently Amended) A semiconductor fabrication apparatus to process a wafer, comprising:
An air-tight housing in which an inert gas is admissible and exhaustible;
and a plurality of adjacent deposition chambers positioned within the air-tight housing, wherein the substrate temperature in forming the thin film is approximately that of room temperature.**

Here, the "substrate temperature in forming the thin film is approximately that of room temperature." This feature as recited in Claim 1 in cooperation with the other elements of Claim 1 is not disclosed by the cited references either singly or in combination.

Accordingly, Applicant submits that Claim 1 is allowable. Applicant respectfully request reconsideration and allowance of Claim 1 as it is newly presented.

As to Claims 2-17:

Applicant respectfully submits that Claims 2-17 are allowable first because they depend from an allowable base Claim and also because they are allowable on their own individual merits. Applicant respectfully requests reconsideration of Claims 2-17 as they are newly amended and presented.

Claims 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dubs et al. (U.S. Pat. 6, 899, 795) in view of Kawakubo et al. (U.S. Pat. 6, 077, 406), Ashtiani et al. (U.S. Pat. 6, 497, 796) and Strahl (U.S. Pat. 4, 664, 935).

Argument

Please note that since Claim 18 discloses many of the same elements as Claim 1, the arguments used to overcome the rejections of Claim 1 also apply here with equal force and effect.

Moreover, Applicant respectfully submits that the combination of Dubs, Kawakubo, Ashtiani, and Strahl does not result in the claimed invention. At best, the proposed combination would result in a method for semiconductor fabrication wherein a chamber magnet is shared with at least one neighboring chamber, a magnetic field normal to the substrate is utilized, a pendulum is utilized, and the substrate is back-biased. The apparatus would generally provide for semiconductor fabrication amongst a plurality of deposition chambers.

By contrast, please see Applicant's Claim 18:

18.(Currently Amended) A method for sputtering a thin film onto a substrate, comprising:

providing a plurality of adjacent deposition chambers, each sharing at least one magnet with a neighboring chamber and having at least one target and a substrate having a film-forming surface portion and a back portion, wherein the substrate temperature in forming the thin film is approximately that of room temperature;
creating a magnetic field so that the film-forming surface portion is placed in the magnetic field with the magnetic field induced normal to the film-forming surface portion back-biasing the back portion of the substrate; and
sputtering material onto the film-forming surface portion.

Here, the “substrate temperature in forming the thin film is approximately that of room temperature.” This feature as recited in Claim 18 in cooperation with the other elements of Claim 18 is not disclosed by the cited references either singly or in combination.

Accordingly, Applicant submits that Claim 18 is allowable. Applicant further submits that Claims 19-20 are allowable first because they depend from allowable base Claim 18 and also because they are allowable on their own individual merits. Applicant respectfully requests reconsideration and allowance of Claims 18-20 as they are newly amended and presented.

CONCLUSION

Applicants' attorney believes this application is in condition for allowance.
Should any unresolved issues remain, Examiner is invited to call Applicants' attorney at the telephone number indicated below.

Respectfully submitted,
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